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Information Bulletin

Grade 6 Science
1994-97

Students First!
Student Evaluation

Alberta
EDUCATION

This document was written primarily for:

Students	✓
Teachers	✓
Administrators	✓
Parents	
General Audience	
Others (Specify)	✓ Superintendents

This bulletin contains general information about the Achievement Testing Program and information specific to Grade 6 Science Assessment. Additional copies of the bulletin may be made as needed.

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October 1994

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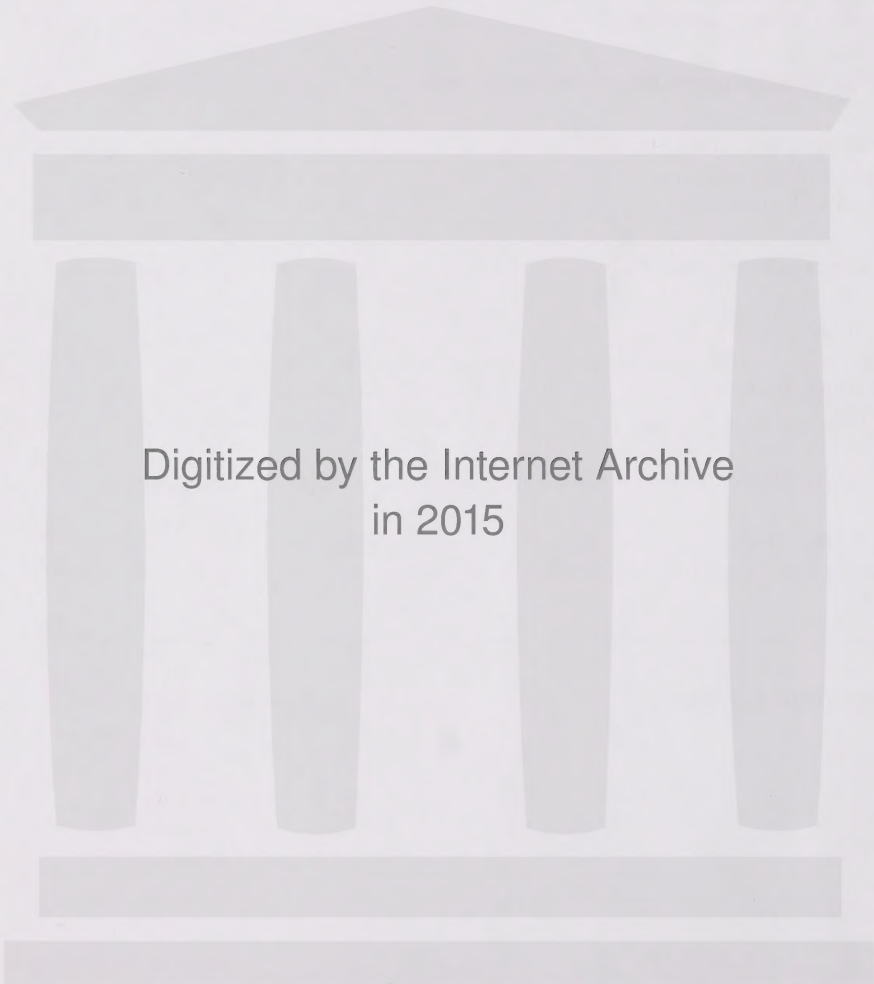
Contents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General Information

The Achievement Testing Program provides teachers, parents, students, school administrators, Alberta Education, and the public with information about what students know and can do in relation to provincial standards. Group results are reported at school, district, and provincial levels to improve learning opportunities for students.

The assessments are administered in two subject areas at Grade 3—language arts and mathematics—and in four subject areas at grades 6 and 9—language arts, mathematics, social studies, and science.

The assessments are based on provincial standards, which reflect important learnings in the subject areas listed above. Classroom teachers from across the province are extensively involved in developing and field testing the assessment instruments.

Administering the Assessment

Information about the nature of the provincial assessments as well as their administration to special-needs students can be found in the *General Information Bulletin, Achievement Testing Program,* which has been mailed to all superintendents and principals.

Schedule

The written-response component of English and French Language Arts must be administered during the first week of June. The machine-scorable component of all achievement tests must be administered during the last two weeks of June. Specific information regarding scheduling is provided in the current *General Information Bulletin.*

To minimize any risks to security, we recommend that all students complete the test on the same day. Students who are absent when the tests are administered and who return to school by the end of the school year must write the tests upon their return. By scheduling the tests early in the administration period, schools can ensure that most, if not all, absentees are tested. The principal is responsible for ensuring the security of the tests.

Beginning in 1995, the tests that will be administered each year are:

Grade 3
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Mathematics (English and French forms)

Grade 6
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Mathematics (English and French forms)
Social Studies (English and French forms)
Science (English and French forms)
Français 6e Année (*Partie A: Production écrite* and *Partie B: Lecture*)

Grade 9
English Language Arts (*Part A: Writing* and *Part B: Reading*)
Mathematics (English and French forms)
Social Studies (English and French forms)
Science (English and French forms)
Français 9e Année (*Partie A: Production écrite* and *Partie B: Lecture*)

Students in French Language Programs

Beginning in June 1995, all students in Francophone and French Immersion programs must write the French form of the achievement tests. Alberta Education will send enrollment forms to schools by February requesting an indication of how many English or French tests are required. These forms must be returned through jurisdiction offices by mid-March.

Marking Achievement Tests Locally

Beginning in June 1995, teachers will be able to mark the tests before returning them to Alberta Education. Teachers can use the results as part of an individual student's year-end assessment, as well as for planning instruction. Additional information regarding local marking of tests will be provided in December 1994.

Reporting the Results

Each school jurisdiction will receive a district report and school reports for their students' achievement, as well as guidelines for interpreting these results in relation to provincial standards.

To facilitate reflection on school programs, we expect that results will be shared with all school staffs (not just teachers of grades 3, 6, and 9), as well as with parents and the community.

Individual student profiles will be sent to the school that the student will attend in September. We also expect that these reports will be shared with parents.

Provincial results will be made public in September. A detailed *Achievement Testing Program Provincial Report* is published annually.

Broadened Assessment Initiatives

The Student Evaluation Branch has developed additional instruments to collect a broader base of information about what students know and can do than achievement tests themselves can provide. These instruments will be administered to a provincial sample of students in all subjects on a rotating basis:

Grade 3

1995 •"whole book" performance-based assessment in language arts
1996 •problem-solving activities in mathematics
1997 •"whole book" performance-based assessment in language arts
1998 •problem-solving activities in mathematics

Grade 6

1995 •problem-solving activities in mathematics
1996 •"whole book" performance-based assessment in language arts
1997 •problem-solving and decision-making activities in social studies
1998 •performance tasks in science

Grade 9

1995 •problem-solving and decision-making activities in social studies
1996 •problem-solving activities in mathematics
1997 •performance tasks in science
1998 •performance tasks in language arts

Description of the Science Assessment Standards

The provincial standards are the basis upon which we assess how well students have learned science by the end of Grade 6. These standards reflect the essential learnings that all Alberta students are expected to achieve. Provincial Standards are useful, therefore, for assessing Grade 6 students in all types of school programs—public, private, and home education.

Purpose of Assessment Standards

These statements describe what is expected of Grade 6 students who are meeting the *acceptable standard* or the *standard of excellence* on independent work at the end

of the Grade 6 Science program. The statements represent the standards against which student achievement will be measured. By comparing actual results to provincial standards, decisions can be made about whether achievement is in fact "good enough."

Acceptable Standard

Students who meet the *acceptable standard* are expected to perform routine cognitive and psychomotor tasks, and procedures that are fundamental to the program. Also, they should be able to solve routine problems and apply skills in novel contexts or situations. For example, they are expected to make observations of what happens to light as it is reflected or refracted and to predict the effects of mirrors and lenses in new applications. They should be able to follow directions to construct a device. Also, they should be able to construct devices that help to solve a problem. For example, they should be able to construct a circuit tester and use it to find the connections in a hidden circuit.

Students who meet the *acceptable standard* are expected to be skilled in the use of basic processes of science and to apply more advanced skills in straightforward tasks. They are expected to know about the impact of science and technology on society and be able to view an issue from more than one perspective. They are expected to form judgements when they have sufficient information to make an informed decision. They are expected to make judgements about environmental problems and to support their views with relevant information.

Standard of Excellence

Students who meet the *standard of excellence* in Grade 6 Science are expected to have a superior understanding of the essential conceptual and procedural knowledge. For example, they are expected to know that energy exists in different forms and can be classified as renewable or non-renewable, and understand that the conservation of energy and the development of alternative energy sources are essential to our future well being.

These students are expected to have a good understanding of concepts and skills. For example, they are expected to be knowledgeable about the local living things and the environments they live in and to make observations and inferences about living things in distant environments. Also, they should be able to interpret a diagram showing the effects of rain on the landforms in a mountain valley and then be able to predict the long-term effects on water flow in the valley.

Students are expected to use their conceptual and procedural knowledge purposefully and confidently. They should be able to perform higher cognitive and psychomotor tasks and use these skills in new or novel situations. For example, they are expected to design and complete a controlled experiment to test the performance of a toy in varied conditions, collect a set of data, and make inferences about the performance of the toy in these conditions.

Students who meet the *standard of excellence* are expected to exhibit an awareness of, appreciation of, and interest in science as it relates to the environment, themselves, and society. They are expected to be open-minded, persistent problem-solvers and be able to look at a problem from a number of viewpoints. Another expectation is that they know how science and technology affects them personally and are able to examine its societal implications. Also, students should be able to investigate a problem by gathering information from a number of sources—even when information is incomplete or has contradictions—and make summary or tentative conclusions.

Grade 6 Science Assessment

General Description

The Grade 6 Science assessment instrument (machine scored) consists of 60 multiple-choice questions.

Students will record their answers on a separate answer sheet. The assessment is designed to be completed in 60 minutes. However, additional time of approximately 30 minutes may be provided to allow students to finish. We suggest that those students who finish writing before one hour has elapsed remain at their desks to review their answers.

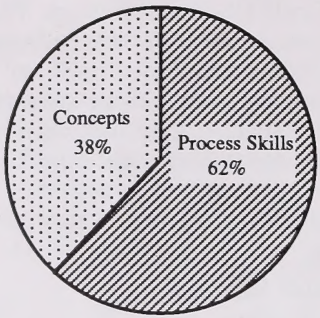
Students will need HB pencils, erasers, and scrap paper. Calculators are not required for successful completion of the assessment but are permitted.

Content

Four major components serve as a guideline for the development of the achievement assessment. These are:

Domain	Emphasis
Process Skills	50%
Psychomotor Skills	10%
Attitudes	10%
Concepts (Subject Matter)	30%

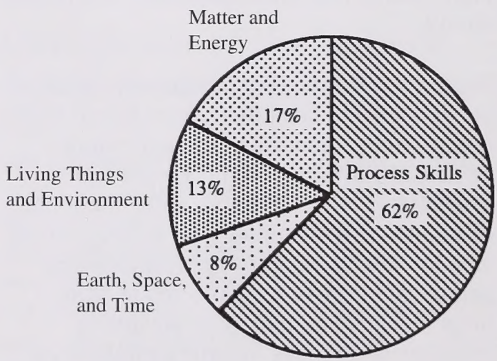
The assessment is limited to those areas of learning that may be efficiently assessed using paper and pencil. While some questions may reflect the psychomotor skills domain, basically it is the process skills domain and the concepts domain that are assessed. The following circle graph shows the approximate assessment emphasis for concepts (subject matter) and process skills.



The concepts domain is divided into three topics to reflect the Grade 6 Science core. These topics are

1. Matter and Energy
2. Living Things and Environment
3. Earth, Space, and Time

It should be noted that within the process skills domain, all process skills will be represented; however, emphasis will be placed on inferring, predicting, controlling variables, and interpreting data. The emphasis given to each topic and to process skills is shown in the circle graph below.



Confirming Standards

Confirming standards is a process whereby judgements about students' performance on the assessment are made in relation to provincial standards. For more information on confirming standards procedures, refer to Appendix A of the *Achievement Testing Program Provincial Report, June 1993 Administration.* For information on the selection of teachers for participation in the confirming standards process, refer to the *Achievement Testing Program General Information Bulletin.*

Blueprint

The emphasis for each assessment component and learning domain are presented in the blueprint.

Grade 6 Science Assessment
Blueprint

Topic	Percent of Course and Number of Questions	Percent Emphasis and Number of Questions	
		Learning Domain	
		Concepts	Skills
1. Matter and Energy	45 (27)	15 (9)	30 (18)
2. Living Things and Environment	35 (21)	13 (8)	22 (13)
3. Earth, Space, and Time	20 (12)	7 (4)	13 (8)
Total	100 (60)	35 (21)	65 (39)

Preparing Students for the Assessment

We hope that teachers will share the following information with their students to help them prepare for the Grade 6 Science Achievement Assessment.

> *I strongly advocate preparing children to understand tests and testing through extensive class discussion about the makeup of the test and how to take it, and then adequate practice to find out their own particular weaknesses in approaching tests.*
>
> –Graves, p. 183

- Talk with your students about some of the positive and negative aspects of taking tests. Share some of your own experiences and have your students share theirs.
- Familiarize your students with the format of the achievement assessment and the kinds of questions that will appear on it by having them work through the sample questions.

Suggestions for Answering Machine-Scorable Questions

- The questions in the achievement assessment are integrated in narrative themes.

  A theme page has a picture and a short description of what the questions that follow will be about. Students should study the theme page carefully—there may be information that can be used to answer the questions.

- Students should use other information given for answering questions by:

  a. reading the information and thinking carefully about it before trying to answer any of the questions that need the information; or

  b. reading the questions first and then reading the information, keeping in mind the questions they need to answer.

- When information is given for more than one question, students should go back to the information before answering each question.

- Students must make sure they look at all forms of information given. Information may be given in words, charts, pictures, graphs, and maps.

- Students should choose the answer they think is best. If they don't see a correct or best answer right away, they are encouraged to find the two choices that seem closest to the correct answer and pick one of them for the answer.

Sample Questions

Presented on the following pages are sample questions reflecting the nature and complexity of the questions that will appear on the Science Assessment.

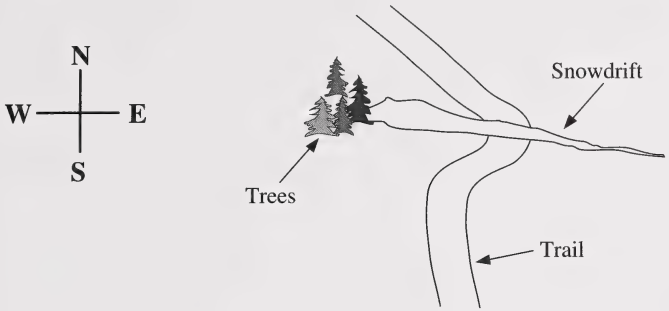
We encourage teachers to familiarize students with the assessment by having them work through these sample questions.

FARM

Susan and Amil live on farms near Drumheller, Alberta. The next six questions are about their experiences.

Use the following information to answer question 1.

Every winter, a large snowdrift forms across a trail near Susan's farm.



1. The wind blows **mainly** from which direction?

A. South
B. East
C. North
D. West

Use the following information to answer question 2.

Susan is experimenting to find the fastest ski for a ski race. She wants to know if long skis slide faster than short ones. She identified these variables:

1. speed of the skier
2. mass of the skier
3. length of the skis
4. steepness of the hill

2. Which variables should she keep the same?

A. 1 and 2
B. 1 and 4
C. 2 and 3
D. 2 and 4

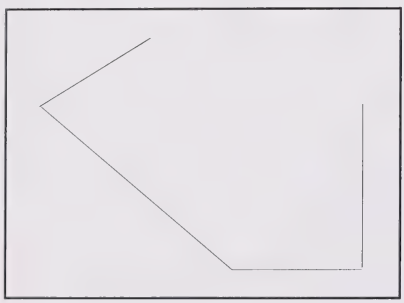
Use the following information to answer questions 3 and 4.

Amil wanted to know where field mice live under the snow. He measured the temperature of the ground surface in different locations in a field. Each location was covered by different depths and types of snow. He recorded his results on a map.

+1°C	–2°C	+2°C	+1°C
–4°C	+3°C	+3°C	–3°C
+2°C	–2°C	–1°C	–2°C
+1°C	0°C	–1°C	–3°C

3. Field mice make paths under the snow where the temperatures are **above** 0°C. Which map shows the **most likely** path locations?

A.



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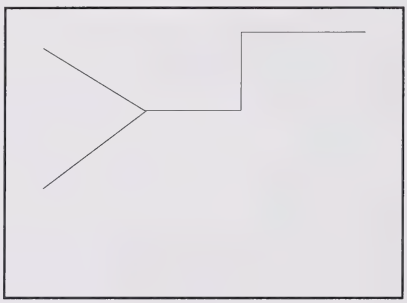

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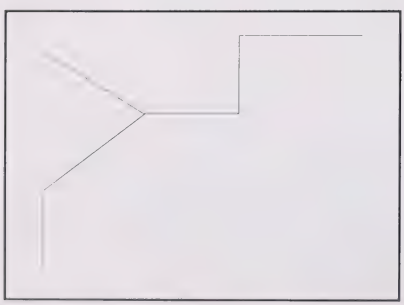

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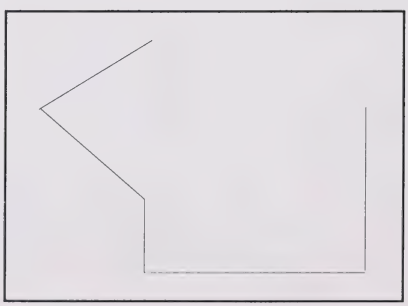


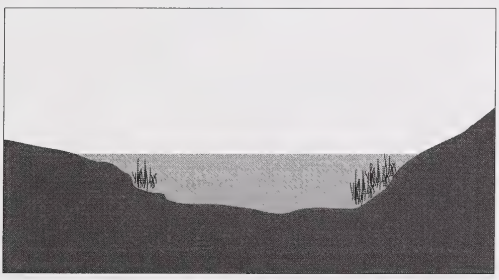
4. If the temperatures **decreased** by 1°C, there would be

A. an increase in the number of paths
B. an increase in the distance of the paths
C. field mice moving in a smaller area
D. field mice moving in a larger area

Use the following information to answer question 5.

In the spring, there were many ducks that nested and fed among the reeds near the edge of a lake close to the farms. In the summer, however, there were fewer ducks because rain caused the lake's water level to rise.

spring



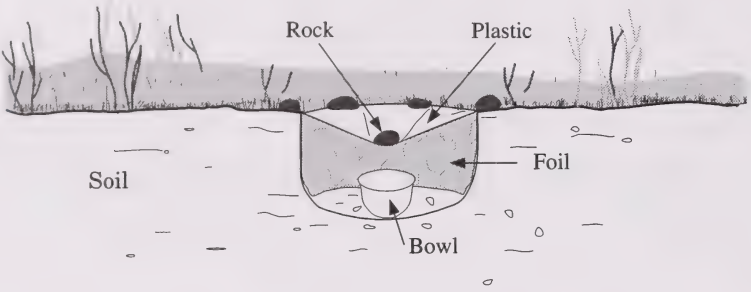
summer

5. The duck population **likely** decreased because the

A. number of nesting areas decreased
B. predator population increased
C. amount of recreation on the lake increased
D. area of shallow water increased

Use the following information to answer question 6.

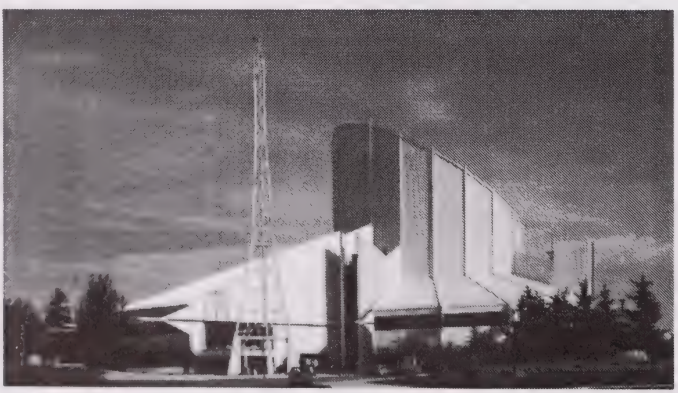
In order to practice desert survival skills, Amil made a solar water still. He dug a small hole in the ground and lined part of it with foil, placed a bowl in the bottom of the hole, covered the hole with plastic, and placed a rock on top of the plastic. The following day, he found water in the bowl.



6. Where did the water droplets **likely** form?

A. In the bowl
B. In the soil
C. On top of the foil
D. On the underside of the plastic

SCIENCE CENTRE



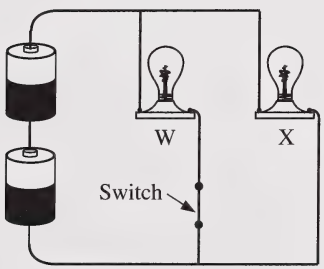
Andrew and Benita are attending a summer camp at a science centre. The next seven questions are about what they saw and learned.

7. Benita studied a display of bean plants showing different growing behaviours. Which behaviour is caused by a response to light?

A. Roots move toward water
B. Leaves grow toward the sun
C. Stems grow straight
D. Stems wrap around objects

8. Andrew made some drawings of circuits used for display boards. If bulb W burns out, in which circuit will at least one bulb continue to glow?

A.



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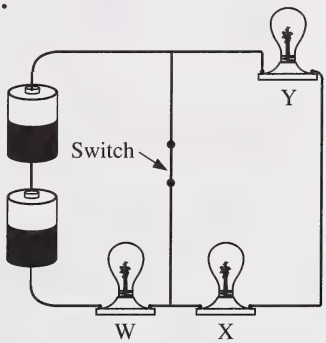

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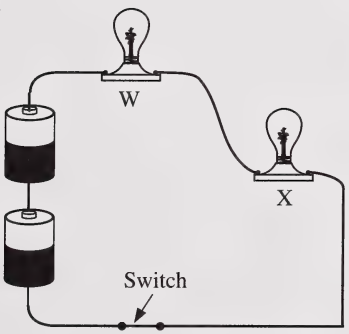

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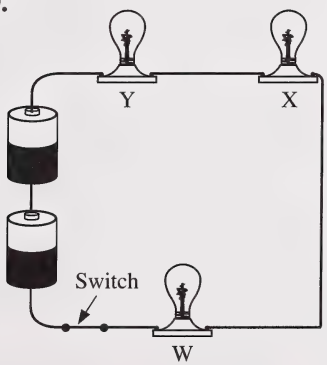
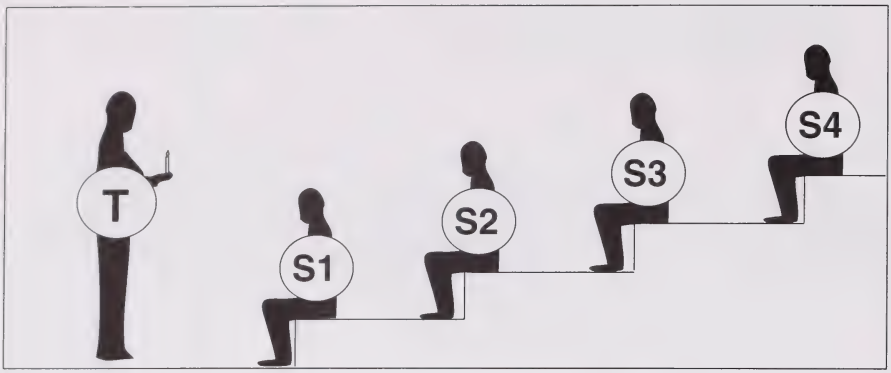


Use the following information to answer question 9.

This diagram shows a teacher holding a candle in the dark.

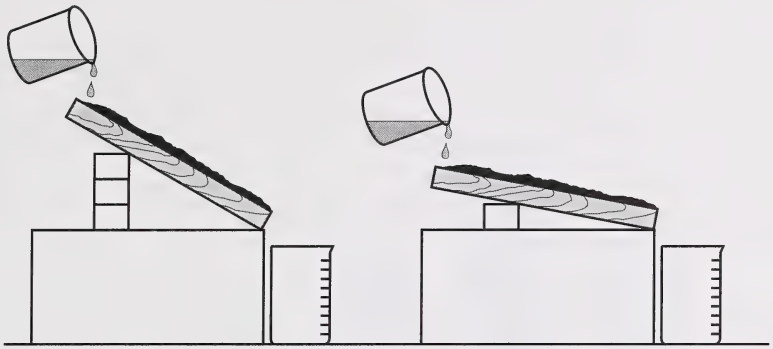


9. To which student would the light appear **least** intense?

A. S1
B. S2
C. S3
D. S4

Use the following information to answer question 10.

Andrew demonstrated an experiment that shows soil erosion in a farmer's field. He set up the apparatuses shown below.



10. Andrew is **most likely** testing that the amount of erosion depends on the

A. type of soil
B. amount of rain that falls
C. amount of plant cover on the soil
D. slope of the land

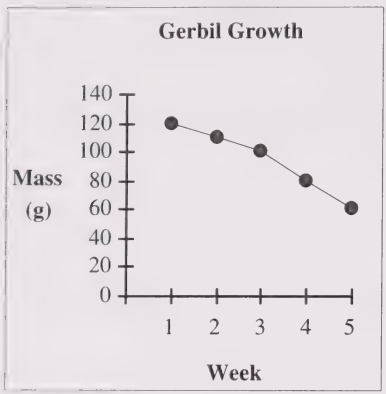
Use the following information to answer question 11.

An animal keeper at the science centre recorded the mass of a gerbil:

Week	Mass (g)
1	60
2	80
3	100
4	110
5	120

11. Which graph correctly shows the growth of the gerbil?

A.



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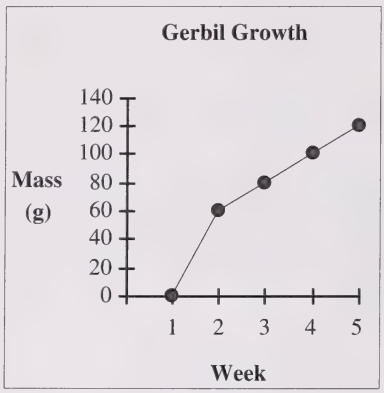

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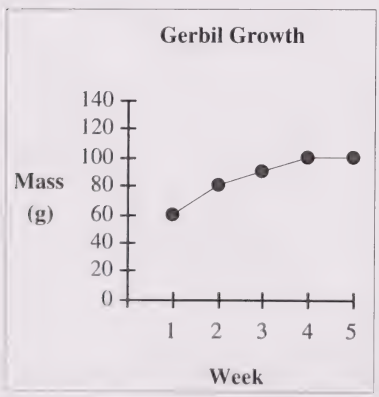

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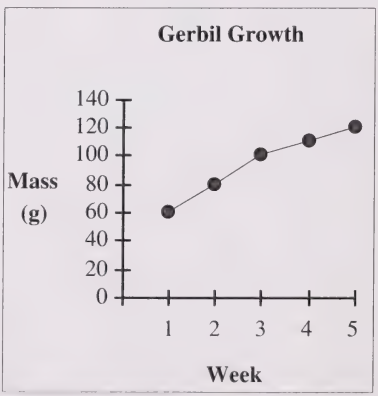
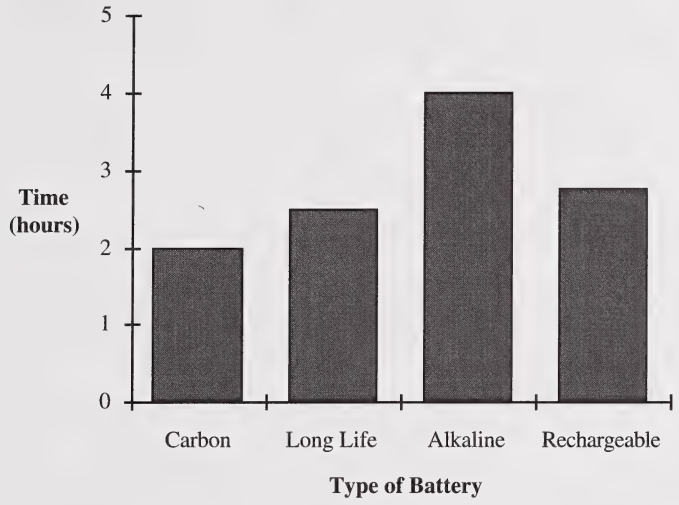


Use the following information to answer question 12.

Benita studied information about how long different batteries lasted when used in a video game.



12. According to the graph, the batteries that were labelled Long Life lasted

A. 2.0 hours
B. 2.5 hours
C. 4.5 hours
D. 5.0 hours

Use the following information to answer question 13.

Andrew looked at a chart showing the boiling and freezing temperatures of different liquids.

Liquid	Boiling Point (becomes vapor)	Freezing Point (becomes solid)
Mercury	356°C	–38°C
Water	100°C	0°C
Alcohol	79°C	–112°C
Bromine	59°C	–7°C

13. If Andrew plans to measure temperatures below –40°C, which thermometer liquid would be **best** to use?

A. Mercury
B. Water
C. Alcohol
D. Bromine

Key and Descriptors for Sample Questions

Ques.	Key	Topic	Learning Domain	Curriculum Standard	Assessment Standard*
1	D	Earth, Space, and Time	Skill	predict the wind direction from the location of a snowdrift	A
2	D	Earth, Space, and Time	Concept	identify variables to be kept the same in an experiment testing the sliding of skis	A
3	C	Living Things and Environment	Skill	infer where a field mouse lives from a map showing temperatures under snow	A
4	C	Living Things and Environment	Skill	predict the effects of decreased temperature on living space of field mice	A
5	A	Living Things and Environment	Concept	identify the cause of a change in duck population	A
6	D	Matter and Energy	Concept	know the effects of solar energy on water in a solar water still	A
7	B	Living Things and Environment	Skill	know that plant leaves move toward light	E
8	A	Matter and Energy	Skill	predict the effect on a circuit when a bulb burns out	A
9	D	Matter and Energy	Skill	predict a decrease in light intensity as the distance to a light source increases	E
10	D	Earth, Space, and Time	Skill	test a variable that affects soil erosion	E
11	D	Living Things and Environment	Skill	communicate data shown in a graph	A
12	B	Matter and Energy	Skill	communicate data in a graph about the life of batteries in a video game	E
13	C	Earth, Space, and Time	Concept	know how thermometers measure temperature	A

*A—Students meeting the acceptable standard should be able to correctly answer questions such as these.
E—In addition to answering the questions identified for the acceptable standard, students meeting the standard of excellence should be able to correctly answer questions such as these.

Credit

Donald H. Graves, *Build a Literate Classroom* (Toronto: Irwin Publishing, 1991), p. 183

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